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## General Notes.

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### GENERAL BIOLOGY.

**Reactions to Stimuli in Paramecium.**<sup>1</sup>—The plan of the author has been to study the reactions of one organism so completely and exactly that we may gain a good idea of its daily activities. Phenomena such as these are to be explained. When a large number of Paramecia are transferred, together with a bit of decaying vegetable matter, from the culture jar to the glass slide and covered with a properly supported cover-glass, we see the Paramecia at first uniformly distributed, a few minutes later beginning to gather about the decaying particle, and soon all accumulated there. Some minutes later the Paramecia begin to disperse, but are always sharply confined within an ever extending circumference. If an electric current is now passed through the water, the infusoria swim towards the cathode, but do not pass the circumference. We seek an explanation of the aggregation of the infusoria, their subsequent dispersion, and their limitation by an invisible boundary, even when urged to pass it by the electric current.

The results of a series of experiments which cleared up one difficulty after another in a manner very interestingly described are as follows: The beginning of the accumulation of the Paramecia is due to thigmotaxis. An individual, hitting the solid body by chance, stops, perhaps starts back and whirls on its axis, then settles against the object and remains there. Others do likewise; thus the accumulation begins. No response occurs to smooth hard bodies. The close application of the Paramecium to the surface and the gliding over it are the results of the peculiar reactions of the cilia induced by the stimulus. But the rapid and complete aggregation cannot be accounted for alone on the ground of thigmotaxis. The author finds that *Paramecia are attracted by a not too strong concentration of carbon dioxide*. The CO<sub>2</sub> produced by the thigmotactic individuals serves to lure the others. But after the crowd has become very dense the CO<sub>2</sub> becomes so strong in their vicinity that the Paramecia are repelled from the region of the solid body and begin to disperse. They do not scatter widely into the culture

<sup>1</sup> H. S. Jennings. Studies on Reactions to Stimuli in Unicellular Organisms. I. Reactions to Chemical, Osmotic and Mechanical Stimuli in the Ciliate Infusoria. Jour. of Physiology, XXI, p. 258-332, May, 1897.

fluid, however, for they are repelled by the latter also, but they keep in a zone of weak concentration of  $\text{CO}_2$ . The chemotactic movements of *Paramecium* were seen also in their repulsion by strong solutions of all acids, including  $\text{CO}_2$ , by all alkaline solutions, to which category the culture fluid belonged, and to certain neutral salts and organic compounds. Towards other organic substances, e. g., sugar, glycerine, urea, *Paramecia* is indifferent. Tonotaxis plays no important part in the normal activities of the organism. The reason why the infusoria are not forced beyond the circumference by the electric current is that they are less strongly electrotactic than chemotactic.

The following weighty conclusion is now drawn: Since infusoria are negatively tactic to their native fluid and positively tactic to the unadvantageous  $\text{CO}_2$ , negative or positive taxis is not necessarily an adaptive movement, is not always determined by its advantage to the species.

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## PALÆONTOLOGY.

**Archegosaurus.**<sup>1</sup>—The results of this preliminary paper are based on the rich material of *Archegosaurus* contained in the “Kgl. Museum für Naturkunde” and the collection of the “Kgl. geologische Landesanstalt” in Berlin. The archegosaurus are preserved in clay-geodes, and in splitting these the bones are generally broken. After the bones had been removed with chisels or fine steel-needles, a mixture of gelatine and glycerine was poured over the plates and very good reliefs of the skeleton were thus produced.

Jäckel intends to write a monograph on *Archegosaurus* and gives only the more important results. He commences with the skull, and afterwards discusses the vertebral column, the limbs and the dermal skeleton.

*The skull.*—In the palatal region he finds some differences from the statements so far given. There exist series of teeth on the inner sides of the vomers and palatines, which show essentially the same arrangement as in the *Labyrinthodontia*. Larger teeth are placed between the anterior ends of the choanæ, and behind these. The choanæ are very much longer than in the *Labyrinthodonts*. This elongation is certainly in relation to the anterior extension of the muzzle of *Archegosaurus*.

<sup>1</sup> Jäckel, Otto. Die Organisation von *Archegosaurus*. Zeitschr. deutsche Geol. Ges. Jahrg., 1896, Heft 3, p. 505–521, fig. 10.